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The Effect of Sternberg Differentiation on Reading Comprehension

A Research Project Presented to the Faculty of Sweet Briar College

In Partial Fulfillment of the Requirements for the Degree
Master of Arts in Teaching

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Table of Contents

I. Chapter One 3

II. Chapter Two 6

III. Chapter Three 17

IV. Chapter Four 19

V. Chapter Five 26

VI. Appendix A – Lessons and Accompanying Materials 29

  a. Lesson 1 29

  b. Lesson 1 Materials 32

  c. Lesson 2 33

  d. Lesson 2 Materials 36

VII. Appendix B – Figures and Graphs 38

  a. Table 1 – SRI Scores Before and After Treatment 38

  b. Table 2 – Averages of SRI Scores 40

  c. Figure 1 – Dependent *t* test Results 40

  d. Figure 2 – Students' SRI Scores Before and After Treatment 40

  e. Figure 3 – Differences in Individual SRI Scores 41

VIII. Works Consulted 42

Chapter One – Identification of the Problem

During the course of my observation of two standard English 12 classes in a rural, public high school, I came to realize the majority of those students struggled with reading. Most of these students performed poorly on the 9 weeks school-wide subject assessment for English. The class averages of scores ranged from 60% to 70% on material that they had covered in depth. Reading comprehension is one problem students face that contributes to their poor achievement. In any class that involves a great deal of reading, students who cannot read well will most likely not learn as much or as quickly as good readers.

Although the SRI (student reading inventory) indicated that most of the students were on- or near-grade level, with a few above-grade level reading, quite a few still struggled with physically reading a text – some were very slow readers – and comprehending the text. Many of these students were purely surface readers who did not look for deeper meaning in the material at all, did not make inferences or predictions about reading. Even on material they had studied in depth like *Beowulf*, the students still scored low on a test which focused mainly on that epic. The format of this test included long, unbroken passages from the epic poem followed by questions. Class averages ranged between 60% and 70%, indicating that this text was on a dependent reading level for them – that without interactive instruction on the material, they still struggled to make sense of the text.

Students thus had problems with reading on many levels. Some had issues on the *automaticity* level of reading. Automaticity is defined here as the ability to read quickly without thinking consciously about the words; it is fast and *automatic* word recognition (Beers 204-5). When students have problems with automaticity, they usually do not know or understand the words they are encountering. Students that struggle with automatic word recognition must then devote more time to extracting the meaning of one word than on how that word contributes to the whole of a passage. However, even the *fluent* readers (those who automatically recognize most words) still did not successfully make full and complex sense of the text. These readers – and they accounted for the majority of students – could

easily make sense of texts that were on low reading levels and presented simple material, but in the reading of more complex and/or advanced material they did not work to reach the same level of understanding with the text, or were not successful in reaching it. A few of these readers do not know how to make predictions or inferences while reading, but with the other students, it appears that the more complex and advanced the text becomes, the less interested they are in working to deconstruct it. They would read young adult fiction and magazines, but could not independently read classics.

Based on these evaluations, I came to ask the question of whether or not differentiated instruction would aid these students in reading. Specifically, I would differentiate instruction by use of triarchic theory (Sternberg 1998) within the content they read, by differentiating content, process, or product. I determined to use Sternberg's triarchic theory for differentiation because students are working with literature which is highly analytical and I want to be able to meet the needs of students whose strengths lie in other areas as well. In this way, students whose strengths are practical will not always be doing analysis but will be able to exercise their own abilities. The aim of this research is to determine if triarchic instruction can increase overall achievement in reading comprehension. I would teach in a way that meets the needs of learners whose strengths are *analytical, creative, and practical,* the idea being that by drawing upon individual strengths – rather than a coverall instruction – students would gain more from reading and understand material more fully than they would with direct and non-differentiated instruction. For example, for students whose primary intellectual strengths were creative, I would use teaching strategies designed to draw upon those strengths with the assumption that this would scaffold learning and motivate students.

Chapter Two – Reading Comprehension

In recent years, student achievement has come into the foreground nationally. Americans are constantly being measured to determine their reading levels, their knowledge about their political leaders, and their knowledge of U.S. History. Standardized tests are back in vogue, and testing everything from math skills to aptitude, but also comparing Americans to students in other countries who consistently outperform them on those tests. Student performance is national news again and scores reveal that an alarming rate of Americans are not only well behind their international peers, but also illiterate. Two problems emerge: low literacy and low achievement.

In a nation where the standard local newspaper is written on a sixth-grade reading level, the only thing more appalling than the errant illiteracy rate is the growing number of Americans who can read but do not. This new crisis surrounds a phenomenon called *alliteracy*. Alliterate readers are those who are able to read but refrain from doing so (Beers 2003.) Although many Americans fall prey to this problem because their jobs and/or family lives eliminate the time for reading, many others simply do not read, and the crisis is the same for both.

In a democratic nation, if the aim of education is to promote and perpetuate democracy, then illiteracy threatens the very fabric of our society by producing uneducated citizens, citizens who do not read. John Dewey was one of the initial thinkers to connect education with democracy, stating that the survival of democracy relies on education, but Bertrand Russell (1928) phrased it perhaps the most eloquently and effectively when he wrote, "an ignorant population is a disgrace to a civilized country, and…democracy is impossible without education." In other words, citizens who do not read do not expose themselves to wide, diverse, and controversial ideas within intellectual confines, and ideas that are produced by the illiterate are more likely to be chaotic, unfounded, or simply detrimental to society as a whole.

With this knowledge and concern in mind, educators have been working over the last half century – through the Cold War and more ardently after the publication of *A Nation at Risk* – to raise literacy rates and produce more skilled readers, readers who better comprehend the texts they encounter. A great number of strategies have been designed and found to be successful at teaching students reading comprehension. Beers (2003) and Tama and McClain (2001) outline and detail numerous strategies that aid everything from word recognition and vocabulary to inferences and analysis.

If we can identify reading comprehension as one of the problems that contributes to poor student achievement, then we must ask what we can do to improve reading comprehension. Purves (1984) in his study on reading achievement in U.S. schools cites the 1981 NAEP study. Some of the interesting and relevant points to this study were the "Countervailing Tendencies:"

- Teenagers read little for their own enjoyment, spent more time watching television than they spent reading, did not read for long periods of time and preferred movies to books.
- About 10% remained unable to read even simple materials.
- Older students displayed less commitment to reading than did younger students.
- Very few students at any age *explained* their initial ideas and judgments through reference either to the text or to their own feelings and opinions.
- The evidence cited by older students does not reflect effective strategies for approaching a text; explanations remained superficial and limited. The overwhelming majority of students lacked strategies for analyzing or evaluating in the interest of deepening their understanding of what they read.

Furthermore, Purves mentions that in terms of international comparison, American students really do perform nicely compared to our foreign peers. Analysis of IEA studies reveals that "comprehension scores on nonliterary and literary texts by 14-year-olds are slightly above an international mean, those of 17-year-olds below that mean" (1984). Purves recognizes this finding as a problem of vocabulary and interest for the older students. So here we begin to identify that part of the problem with reading and achievement results from the jadedness toward school that only worsens as students get older, leading to another facet of the problem.

Gad Yair (2000) conducted studies on students' engagement with instruction, finding that there is a correlation between engagement and learning. He explained that students who are engaged in instruction are usually going to learn something even if the material is irrelevant, or not authentic, or even boring. Conversely, he found that when students are disengaged from instruction, they are less likely to learn anything even if the teacher is an expert on the content and the content is relevant and interesting. The studies conducted showed that students were most engaged in instruction during laboratory work, individual or group presentations, and discussions, the work that requires active involvement. They were least engaged during *direct instruction* or films, where they can be passive audience members. Math, science, and reading were the subjects most likely to engage and keep students involved, probably because they are content areas that require interaction between the student and the material. Yair also found that "low-achieving" students are usually the least engaged in class. This finding supports the idea that when students do not expect to be successful, they are less willing to put forth effort in the first place.

Most of Yair's findings support what educational researchers like Ron Brandt have been saying now for years. Brandt lists several needs that must be met in order for learning to occur. Essentially, learning must involve material that is meaningful, challenging, developmentally appropriate; in a learning environment where individuals are allowed to learn in their own individual way, to build on prior knowledge, to interact with others, to receive and be able to use feedback, and to make use strategies for learning that students seize and adapt; and where students feel emotionally safe and academically focused (Brandt 1998).

Yair's findings corroborate with Brandt's. Yair found that the better the home environment, the better the classroom engagement, and also that the more time spent doing homework corresponded to a positive relationship with engagement in class. He said, "The more relevant instruction is to students' lives, the more it challenges students' ability, and

the greater the academic demand that students experience in class, the more likely they are to be engaged with instruction." Brandt cites that students need to be challenged and interested. Yair's study found that when curriculum and instruction are "demanding and relevant" at-risk kids are almost as engaged as those not at risk. The problem therein lies in another of Yair's findings, that "classes are perceived to be less challenging, less relevant, and less academically demanding at the upper grade levels." So, from the beginning, it appears the instructional environment is all wrong for learning and that the curriculum isn't working as it should.

Thus far we have identified literacy rates as only half the problem that leads to the real problem: achievement. Logic follows that students who cannot read will not perform as well in school or learn as much as students who can read and read well. However, literacy is not the only problem. Engagement appears to have a high impact on learning and comprehension, and is directly related to the overall instructional environment, so there must be some way to increase engagement and improve the overall environment. The answer lies in differentiated instruction.

The idea inherent in differentiated instruction is that all students are different, have different needs, strengths, weaknesses, interests, backgrounds, and ways of learning. Explicit or guided instruction in reading comprehension only confronts the problem that students are unskilled readers. It does not explore the diverse needs and reading abilities of all the students in group, but differentiation does. Differentiation is the obvious course when one considers it, but educational systems and educators continue to ignore the basis and foundation for differentiated instruction and teach all students the same material in the same format at the same pace. The reason behind this behavior lies in the fact that traditional instruction is perceived to be easier, less time-consuming, and the most familiar for teachers who were taught in the same fashion. This one-size-fits-all teaching format does not provide what students really need.

Differentiated instruction is designed to meet the many and diverse needs of a heterogeneous group of learners. In any one classroom, a teacher may have students who are way below-grade level reading, who are far above, who are learning to speak English, who have dyslexia or other learning disabilities, who are physically handicapped, and who come from a wide array of cultures and backgrounds. Why would a teacher instruct all of these students using the same cover-all approach? One teacher might do this because it is the easiest approach, but also because he has not realized that such an approach will only be successful in reaching a small portion of his students. Another teacher may realize that the majority or only some of his students are learning the material and passing, and determine that such a percentage is perfectly fine. A different kind of teacher evaluates the low student success and determines that he must begin to his instruction may be the problem. He may use differentiation to meet the various needs of his students. There is a growing research base to support differentiation, having to do both with achievement as well as attitudes that influence achievement.

The majority of students who fail, drop out, or just fade out of high school do so because they become disillusioned and jaded by an educational system that seems to ignore their needs and thus destines them to failure. The fate of education rests in an organizational overhaul in order to do what it claims to do and provide what is necessary for students to be able to learn. As Wiggins and McTighe (2005) aptly say, "We so easily forget: It is not teaching that causes learning...Only successful attempts by the learner cause learning." Examined in that light, without differentiation we are not providing the motivation students need to work for learning. We can teach kids everything from string theory to Parliament, but if they do not see value in learning the ideas and if they do not try to learn them, they will not. We can all see examples of this in our own pasts, be they from that difficult trigonometry and its cosines or that quirky English language and its homophones; we have all struggled with material that teachers did not work – or even try –

make real to us, to make useful, to make relevant, and to make available by exploiting our strengths and helping us to realize and correct our own weaknesses – by *differentiating*.

Because differentiation meets its own intent, there is no *one* standard way to differentiate. Teachers can differentiate instruction by readiness and by student interest, probably the most widely used – if not realized – methods by most teachers. Readiness differentiation realizes that while most of a class does not know a semicolon from a comma, Kevin is a syntax genius and would most benefit perhaps from peer instruction, working on the idea that the ability to teach material reflects one of the highest levels of understanding. Student interest differentiation realizes that Harriet really likes Jamaica Kincaid, and even though her teacher could never give the rest of her class *Girl* to read because of its total lack of punctuation, she would absolutely adore reading this poem, analyzing it, and attempting to write something similar of her own. Differentiated instruction paves that road.

Differentiation by readiness has its research basis mostly in the studies on the effects of tracking on student performance, but studies are beginning to emerge that look at within class effects. Ireson and Hallam (1999) conducted and collaborated a multitude of British research that basically found ability tracking over time had the most beneficial effect on advanced students and the most detrimental on the low ability groups. Effect covers achievement, performance, and attitudes (toward school and self). They did identify several tenets than can reduce the negative effects or promote the positive effects of ability grouping: they are

- Shared vision and goals
- [Positive] Learning environment
- Concentration on teaching and learning
- Purposeful teaching
- High expectations
- Positive reinforcement
- Monitoring progress
- Pupil rights and responsibilities
- Home-school partnerships

(Purves 1999)

When these qualities are present and utilized in a positive manner, the influence can lead to positive results for tracking and/or ability grouping. These studies were done large-score on tracking not within-class ability grouping, but should be able to be generalized to within-class performance.

The more technical forms of complex differentiation aim to meet students' needs on three different levels: learning modalities, multiple intelligences, and triarchic intelligence. Learning modalities are the sensory ways in which we learn, being visual, auditory, or kinesthetic. I am a visual-kinesthetic learner, meaning that I like to see what I am learning in different ways, and I like to move around while learning and sometimes to pick up what I am learning about and tinker with it. Auditory learners benefit from hearing and speaking about what they are trying to learn.

Dunn has conducted extensive research on the positive impact of differentiating instruction by modality preference, mostly with learning disabled students. In research on SPED students in New York State's Buffalo City Schools, results indicated that scores on standardized achievement tests rose significantly after differentiation was incorporated. Some students in fact performed as well as their non-disabled counterparts (Dunn and Debello 1999). In this study, lasting several years and including the staggering introduction of "learning-style responsive" strategies (such as "soft lighting" and "global (anecdotal) introductions to each new and difficult lesson that related the subject matter to the students' lives and experiences"), benefits grew over time. "As each of the learning-style strategies was introduced, achievement-test scores increased, lateness gradually disappeared, absences were reduced, and students' behaviors became appropriate and polite!" (Dunn 2002). In a study specifically on the effects of tactual/kinesthetic instruction on junior high LD students, Dunn found that LD students performed significantly better on grammar tests than when their instruction was not differentiated (Dunn 2002). Overall, she found that "research documents that children taught with responsive learning-style approaches, achieve significantly better than they do when not taught with learning-style approaches."

The Multiple intelligence theory is in some ways an expansion of the modalities. Howard Gardner's theory delineates eight intelligences that compose intelligence as a whole. Like learning modalities, we each have them all in us, but some are stronger than others. The eight intelligences are: linguistic (word smart), tactile/kinesthetic (body smart), logical/mathematical (reasoning/number smart), spatial (visual smart), musical, interpersonal (people smart), intrapersonal (self smart), and naturalist (nature smart) (Gardner 1983).

Recent research reveals the effect of Multiple Intelligence differentiation on improving reading comprehension. Reidel, Tomaszewski, and Weaver conducted research on 550 fifth-grade where lesson plans for five stories in the curriculum were differentiated for multiple intelligences. As a result, students showed vast growth in reading comprehension, an improvement of "81% to 85%" as measured by scores on tests designed to measure reading comprehension. Observation also revealed that student motivation and involvement in reading also improved (Reidel 2003).

The method of differentiation that will be used in this study is that of Robert Sternberg's Triarchic Theory. Sternberg's categorizes intelligences as creative, analytical, and practical, and these are the ways in which people think or learn primarily. The creative learners like to take problems and create solutions because they are curious about using their knowledge. The analytical like to look at problems from all angles and try to figure why there was a problem in the first place and how best to fix it. They *deconstruct* to better understand knowledge. The practical approach problems and solve them in the most efficient and effective manner, they readily and easily *apply* knowledge. We all have a bit of each of these aspects in us, and the dominant intelligence varies according to the situation. For example, tests indicate that I am creative-analytical, but when it comes to math, I can be more practical than analytical, more concerned about the end result than the process.

Triarchic instruction seeks to use three defined intelligences to build student knowledge and understanding. Briefly, analytical tasks concern "analyzing, judging, evaluating, comparing and contrasting, and critiquing"; creative, "creating, inventing,

discovering, imagining, and supposing"; and practical, "implementing, using, applying, and seeking relevance" (Grigorenko, Jarvin, and Sternberg 168). The aims of triarchic instruction are to encourage students to build knowledge and understanding by taking advantage of all three inherent intelligences. Just as important, triarchic instruction aims to let students focus on strengths while developing areas of weakness. Triarchic instruction also attempts to make material more interesting through its diversity (Grigorenko, Jarvin, and Sternberg 2001).

Previous experiments to determine the correlation between reading improvement and triarchic instruction have been undertaken in the past. During one middle school study over successive years, the curriculum was intensely infused with triarchic materials and assessments and the end result yielded that the treatment was significant at the .01 level. A six-week summer study conducted by the same group, utilizing a test group and a study group also revealed the significance of triarchic instruction on reading improvement (Grigorenko, Jarvin, and Sternberg 2001).

Overall, research findings suggest that differentiation is highly beneficial to student success. Studies that have been conducted on student engagement and student performance indicate that using instructional techniques that appeal to students' strengths and interests. Sternberg's triarchic instruction specifically has been shown to have positive effects on both student engagement and performance.

Chapter 3 – Methodology

To begin this research study on the effect of Sternberg differentiation on reading comprehension, the SRI (student reading inventory) was administered to two standard-level English classes on January 25. The scores from this test represented student reading comprehension before the introduction of differentiated instruction. When this test was administered at the beginning of the year, scores revealed that most of the students were on or very close to grade level reading. Similar findings were anticipated and found with this second test.

Immediately after the test was administered, I began to differentiate instruction by Sternberg intelligence preference: creative, analytical, and practical. Instruction might have been differentiated through content, process, or product. Here two post-reading assignments were differentiated in order to appeal to different intelligences: the first after finishing the play *Othello* and the other after reading a selection of Pirate creeds for the start of a research unit. The culminating tasks and how they appealed to the intelligences varied by the reading and overarching themes we were studying at the time. Many other assignments were also be tiered by readiness in order to take advantage of proximal development and let students learn within their appropriate instructional level.

After ten weeks of teaching via triarchic instruction, the SRI test was administered a third time on April 10 and those scores were collected for analysis.

The following paragraphs outline the schedule and structure of the study.

1. Test students to determine Sternberg preference. This step was actually undertaken in September and results were saved for later use.
2. Administer SRI reading assessment on January 25. These scores are used not only for comparison with post-treatment scores but also for diagnostic purposes, to remain vigilant of students' reading abilities for proper scaffolding.

3. Administer Sternberg differentiated lesson on February 17. This triarchic lesson helps students analyze the characters and major themes of *Othello* through the use of writing prompts differentiated both by Sternberg and readiness level.
4. Administer Sternberg differentiated lesson on March 2. This triarchic lesson utilizes Pirate creeds to help students understand pirates and how teams function. Students are organized into groups by their Sternberg intelligence preference. The practical students use real pirate creeds to compile a classroom creed. The analytical brainstorm classroom strategies and activities that could be taken from other classrooms and used in our classroom. The creative devise a pleasing visual display for the classroom creed.
5. Administer second SRI assessment on April 10. The scores from this testing are compared to the January SRI test and also to monitor student progress.
6. Analyze scores for change using a dependent *t* test. Scores will be analyzed using a dependent *t*-test to look for the significance of differentiated instruction upon reading comprehension as measured by the SRI data.

Chapter 4 – Results and Analysis

The objective of this project was to determine if Sternberg intelligence differentiation improved reading comprehension as measured by SRI (Scholastic Reading Interactive) scores taken at two points in time, pre-treatment and post-treatment. In the original design of the project, there were to be many treatments utilizing Sternberg intelligences. However, in the course of the project, the original treatment was able to be used only twice.

In actuality, there were two specific instances of treatment given. One treatment was done in February at the end of reading Shakespeare's *Othello.* In this first treatment, students were to write essays based on prompts that appealed to their Sternberg intelligences. Please see *Appendix A, Lesson 1.* All of the writing prompts provided required students to draw upon their knowledge of the play and understandings of its themes in order to write. They must have read and understood the plot, the characters, and the themes in order to complete the assignment successfully.

The second instance of treatment occurred in early March at the beginning of a research unit focusing on pirates and the 17th century. Please see *Appendix A, Lesson 2.* In this treatment, students took part in a lesson on pirate creeds. As part of the lesson, they read examples of pirate creeds and the different groups had different tasks that appealed to their specific Sternberg intelligences. For students to complete their tasks successfully, they must have read the Creeds and understood the underlying principles behind pirate creeds.

Utilization of learning style differentiation by Sternberg intelligence preference was selected on the assumption that by appealing to students' particular learning strengths, student performance in any targeted area would improve. As summarized in chapter two, Sternberg differentiation has been shown to affect student achievement positively in other areas during previous research. This research project hoped to add to the growing support base for that form of differentiation. For this project, one group of students was tested before and after a treatment (learning styles differentiation by Sternberg intelligence

preference), to determine the effect of this differentiation on reading comprehension as measured by scores on the SRI test. To analyze the statistical significance of the treatment a dependent *t* test was calculated. *Before* scores and *after* scores on the SRI were compared using this test. At the 0.05 level, the obtained value was 0.523. For a two-tailed test with 36 degrees of freedom, the critical value is set at 1.69. The obtained value was not similar to nor did it exceed the critical value, therefore in this case, the null hypothesis must be accepted – that the treatment had no significant effect on reading comprehension. The following table illustrates the results of the dependent *t* test.

Figure 1: Dependent *t* Test Results

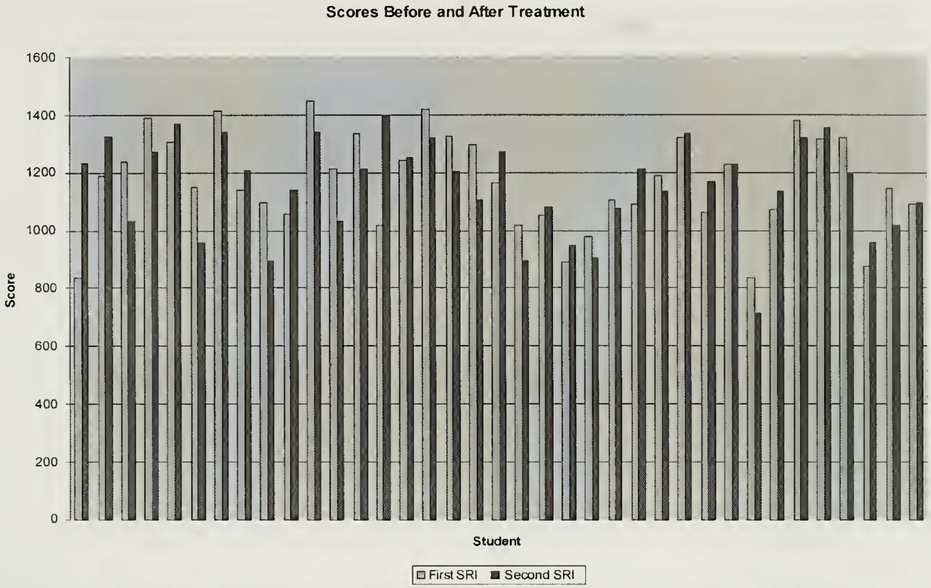
Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Before - After	15.00000	141.40584	23.24698	-32.14705	62.14705	.645	36	.523

Based on the outcome of the test, it must be assumed that in this case the treatment (Sternberg intelligence differentiation) had no significant impact on reading as measured by the SRI scores. These results, however, do not negate the treatment's power completely, but for the purpose of this test, the treatment was not significant. In other tests with differently designed implementations and tests, the treatment could be found to have a greater impact than this data suggests.

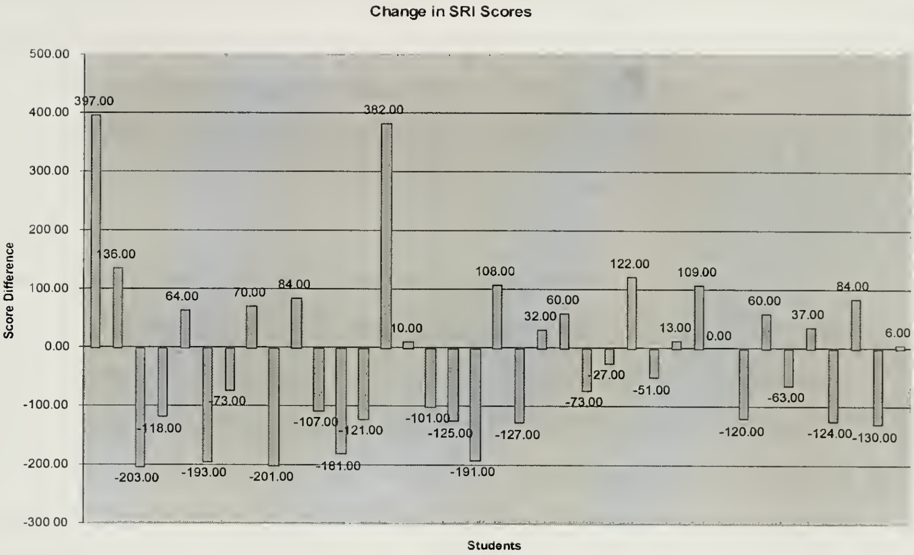
The following graph chart displays the two scores from the two tests the students took on different dates. (See Appendix B, **Table 1** for individual scores and **Table 2** for averages of figures). As the bars illustrate, more scores actually decreased on the second testing. A total of seventeen scores increased, eighteen decreased, and one did not change at all. Essentially, half the scores improved and half dropped. Even without using a statistical test, all evidence indicates that the treatment had little or no impact on the scores, especially considering that the treatment should not have caused reading comprehension to regress.

Figure 2: Students' SRI Scores Before and After Treatment



It may also be helpful to examine the changes in the scores visually. *Figure 3* below graphically represents the individual changes in each score. As may be seen, more bars appear in the negative than in the positive. This finding does not invalidate the power of differentiated learning style instruction by Sternberg intelligence but simply denies the significance of that treatment for this project and its parameters, given the threats encountered throughout the course of the study.

Figure 3: Differences in Individual SRI Scores



Based on all of the data gathered, the outcome of this project denies the statistical significance of Sternberg intelligence learning style differentiation. However, the growing research base for differentiated instruction supports the use of differentiation for improving student achievement in all academic areas, and the researcher believes that in other circumstances, this treatment could be proven statistically significant with the right research design and measures. Further examination of the overall project should allow for a better statistical analysis of results.

Due to changes in the structure of the project and a number of other influences, it is necessary to discuss the validity of this project before analyzing the statistical significance of Sternberg intelligence differentiation. Several threats presented themselves upon examination of the project.

First, the project was intended to treat students with Sternberg intelligence differentiation several times over the course of the study. Unfortunately, due to various other influences and interruptions, the treatment was actually only performed twice.

Because of the absence of the other exposures, the treatment was probably less effective than it could have been.

Second, when the project was begun, there were to be roughly fifty subjects tested, but due to absences and technological errors, the final number of complete pairs of scores was reduced to thirty-seven. The absence of those other pairs may have affected the overall outcome of the analysis. Those scores may have been significant to the outcome, not only contributing to a larger sample size but also a wider range of scores.

Third, the test was not administered to all students on the same date at the same time due to technological complications. There were some instances of the test program closing down abruptly, interrupting students in the middle of the test. On one day in particular, the database crashed right before students were to take the test and the date and time had to be adjusted. These students were not able to take the test until roughly two weeks after their counterparts because of delays in the server repair that would enable the program to function properly.

Fourth, there were any number of internal and external threats to validity that presented themselves as the project went on. The internal threats that could not be accounted for in this case included: history, maturation, testing, and regression. History: although students had not specifically received Sternberg intelligence differentiation in the past, they had received readiness differentiation which may have had a lasting effect on their responses. Students have been subjected to some differentiation in the past, and those episodes could present a threat to the validity of this study. History may have also affected a student's score on either test due to outside personal factors that the researcher was not aware of. Maturation: although the original design was to administer several treatments over a prolonged stretch of time, because the actual could not administer all of those treatments, the case may be that the improvement that happened with several cases was simply the result of natural improvement in reading over time. Testing: it may be that some students experienced text anxiety that affected their scores for better or for worse, effectively

overriding their response to the treatment. And regression: the students took this test a total of three times (once at the very beginning of the year as a diagnostic tool, and twice for this project), it may be the case that their scores regressed toward the mean upon repeated testing.

The external threats were as following: interaction of testing and treatment, interaction of selection and treatment, reactive arrangement, and multiple-treatment interference. Interaction of testing and treatment: students knew their scores were being used in a research project and this knowledge may have affected their test results. Interaction of selection and treatment; the group studied was composed of a regular senior English class. The case may be that these students are not representative of the whole, and that in other cases or in a more-controlled experiment, the treatment would be shown to have a more significant impact on the study. Reactive arrangement: again, the students were aware of their being part of a research project and this may have influenced their overall response to treatment or to testing. And multiple-treatment interference: because the test was administered several times, it is quite probable that the test had a residual effect on students' scores.

Fifth and finally, there is also the issue of the test itself. Although SRI has been tested and shown to be a valid test, it is still an interactive test. Questions change as a result of student responses during the actual test, and because of the interactive nature of the test, it may be normal for scores to fluctuate within a hundred points when two tests are given within a relatively short time period (ten weeks) considering the test was designed to used a yearly diagnostic tool.

Several threats to the validity of the overall project have been considered. With careful changes to the design and implementation of this project, the outcome may differ significantly. Chapter five summarizes the necessary alterations for the project to be redesigned and implemented.

Chapter Five – Revisions and Recommendations

The original design of this project was to administer several treatments of the Sternberg intelligence learning style differentiation over a ten-week period, but the actual project fell shy of this goal. The following chapter outlines recommendations for further attempts at similar projects.

Were this project to be retested, multiple aspects would need to be adjusted. The original plan of the design is not completely useless, but does need readjustment. A new timeline might resemble the following: initial pre-treatment SRI test, implementation of several treatments, post-treatment test. Ideally, there should be at least one Sternberg treatment per week which focuses on or requires students to draw upon reading comprehension. As many treatments as could reasonably be designed and successfully administered would be best in order to ensure that the treatment caused change and not maturity.

Another change that should be considered is the use of another assessment or multiple assessments to measure the development of reading comprehension skills as a result of the treatment. Because the SRI is an interactive test which fluctuates upon repeated testing, there may be a more reliable or more standardized test that could yield more definite or more constant results. A researcher-designed test could possibly be administered, but would have to be carefully composed and calibrated to ensure its validity. Incorporating another test may help to combat the risks to internal validity caused by testing and regression.

Reorganization of the test base and timeframe itself could yield significant changes in the outcome of the project. In the future, to combat threats to validity from history and testing, the project could be implemented on two groups from the very start of the year, perhaps lasting a semester. One group would receive the treatments and the other group would be a control. Neither group would be informed of its presence in a research study.

Two tests would be needed, one as a diagnostic and the other to measure change at the project's culmination. Students would not be aware of their presence in a study nor would they take the same test more than twice. These changes would also help to prevent threats to validity brought about by testing and regression. By having a control group, researchers would be able to compare the differences between the study group and the control group and analyze the effect of maturation versus treatment.

Most of the changes proposed here are designed to protect the project from multiple internal threats to validity, but little can be done to combat threats to external validity. Possibly by keeping students ignorant of their presence in a research study, the threat of the interaction of testing and treatment would be controlled because the test itself would appear less intimidating. The threat of the interaction of selection and treatment would possibly be more of a threat with the new design because one group would be getting no treatment and the other all treatments, and neither group may be representative of the whole. The threat of reactive arrangement might be tempered by the nondisclosure of the project to students. Finally, the multiple treatment threat might be decreased because the number of tests would be reduced.

One final consideration to the design might be a writing component. The correlation between reading proficiency and writing skills has been shown to be strong. Perhaps the project could incorporate more writing-intensive activities throughout the project or use an assessment with a writing section in order to encourage reading improvement through writing.

Were this researcher to conduct this study once more, the above changes would definitely be part of the redesigned effort. The study would be conducted during the first semester using a test group and a control group. Treatments would be frequent and focused. Only two tests would be administered, one to diagnose reading skills and the other to reveal changes due to maturation or treatment. The SRI may or may not be used as that assessment again, depending on the availability and validity of other tests.

However, despite this study's results, the researcher believes that learning style differentiation by Sternberg does have lasting, beneficial results not only on reading skills but also student performance all around. Any teaching that allows students to focus on and build their strengths is valuable and should be implemented more often in classrooms everywhere through the use of differentiation.

Appendix A – Lessons and Accompanying Materials

Lesson 1

COMPREHENSIVE LESSON PLAN **DATE:** 2/14/06-2/17
GRADE LEVEL / SUBJECT/TOPIC: English 12, *Othello*, Act 5
DEVELOPED BY: Savannah Oxner
STANDARDS ADDRESSED:

12.6 The student will read and critique dramatic selections from a variety of authors.
- *a) Describe the plot, conflict, and setting.*
- *b) Compare and contrast the ways in which character contributes to the theme and dramatic effect.*
- *c) Identify the most effective elements of selected plays.*

OVERARCHING CONCEPT: Human nature
RESOURCES: graphic organizers, test, culminating assignment handout

LENGTH OF LESSON: 3 days

PLANNING WHAT STUDENTS WILL:

KNOW (STANDARDS/CONTENT): relationships, revenge, reputation, tragic hero

UNDERSTAND (BIG IDEAS, ENDURING UNDERSTANDINGS)

- BIG IDEAS (RELATE TO CONCEPT ABOVE):
  - Iago manipulates characters based on their emotions and flaws.
  - Othello's flaw leads to his tragic downfall.
  - Love can make you crazy.
  - Revenge is a powerful and dangerous emotion.
  - Archetypes are reoccurring themes and characters found throughout Shakespeare's work and literature.

- ESSENTIAL QUESTIONS (HOW OR WHY):
  - How does Iago take advantage of different flaws or emotions in the different characters? What does this tell us about his knowledge of human nature?
  - How does Othello's insecurity lead to his tragic downfall?
  - Why does Othello believe so strongly that Desdemona has been untrue?
  - Why must Othello die? Why does he kill himself?
  - How can love affect behavior and reason?
  - Why do people seek revenge? What do they really expect to gain from it? What does it tell us about people that they are obsessed with revenge?
  - How do archetypes operate in literature? Why do are certain themes perpetuated, like the tragic hero?

DO (SKILLS, PERFORMANCE – ACTION VERBS):

- THE STUDENT WILL
  - Read Act Five.
  - Analyze how *Othello*'s dialogue contributes to and creates characterization, and reveals plot.

    - Discuss how the tragic flaw in Othello seals the characters' destinies.
    - Discuss what love does to people, how it affects reason and actions, how it can become destructive and dangerous.
    - Discuss how archetypes survive. What makes them so strong? What do they tell us about culture?
    - Review and record plot structure and character information.
    - Compose a written culminating essay that demonstrates understanding of character and plot.

PLANNING PRE-ASSESSMENT:

TEACHER DOES:

- WHAT STRATEGY DID YOU USE? Administered surveys to determine Sternberg intelligences.

- HOW WERE RESULTS USED TO DESIGN INSTRUCTION? The final culminating assignment was differentiated in order to provide options for the three intelligences.

STUDENTS DO: Students took surveys.

PLANNING THE LEARNING EXPERIENCE:

INTRODUCTION (HOOK): Teacher tells the story of how during one performance of *Othello* in the Old West, one audience member actually shot *Othello,* reminds students that this is considered one of the Shakespeare's most intense plays, and that they are very close to learning why.

- TEACHER DOES: Ask students to predict what will happen in the final scenes of the play and record this information so that together you may verify or discount it as students read the play.

- STUDENTS DO: Make predictions about how the play will end.

BODY:

    - TEACHER DOES: During reading, the teacher will pause them occasionally to explore sections and ask important questions that pertain to plot, characterization, and the major concepts.

- STUDENTS DO: Students read aloud and/or act out Act Five, and discuss sections and dialogue.

- IF DIFFERENTIATED:
    - WHAT(content, process, product)? Product
    - HOW (readiness, interest, learning profile)? Sternberg intelligence
    - WHY (What identified need prompted you to differentiate this way)? Focusing on students' strengths in order to improve and focus writing.

CLOSURE:

- TEACHER DOES: Summarizes important plot developments and action from Act Five. Leads discussion of what character faults or misunderstandings led to the tragedy.
- STUDENTS DO:
    - Record plot developments and action in their graphic organizers.
    - Discuss the end of the play and how the action led to this end.
    - Watch Act Five of the film.
    - Compose essays.
    - Take final test.

ASSESSMENT/CULMINATING PERFORMANCE

- DESCRIPTION: Students will compose a final essay that explores character and plot. They will choose from two topics within their Sternberg intelligence. This essay should involve a prewrite, revision, and a final draft. Students should be given one full period during class to work on this essay and then should complete the essay outside of class.
- HOW DID YOU MEASURE:
    - CONTENT (know): Final test and essay
    - UNDERSTANDINGS (related to big ideas): Final test and essay
    - SKILLS (be able to do): Essay

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Lesson 1 Materials

Othello Final Assignment

Analytical

1) There are several points throughout the play when Iago could have been stopped and the play would have become a comedy. Pick two of these moments and explain how they could have played out for the better, and what might have happened to the characters as a result.

2) Othello is classified as a tragic hero. Think about the decisions he makes and his behavior. Identify what you believe to be his *tragic flaw*. Is it love? Jealousy? Insecurity? Something else? Identify what leads to his downfall and give examples (events, dialogue, etc) from the text that support your claim.

Creative

1) Pick one of the following characters: Desdemona, Othello, Emilia, Iago, or Cassio. Write from the first person perspective. At the end of Act Four, what would be your inner

monologue or thoughts? Remember the music from Desdemona's Willow Song and use it to help focus your thoughts.

2) Rewrite the last act of *Othello* so that the play becomes a comedy. You may summarize the action or write it out like a play, or you may combine the styles as you saw in Ms. Kelley's versions. In this new version, Othello, Desdemona, and Emilia all get to live, but you decide how. Make sure to include *all* of the major characters (Iago, Cassio, and Roderigo), sorting out the necessary problems for each of them and telling the reader their assorted fates. And don't forget to tell what should we do about Iago.

Practical

1) Pretend that you're a character in the play and you've learned about Iago's evil plot. Choose Othello, Desdemona, or Cassio and write a letter to him/her warning that character about how to avoid Iago's trap. Give advice on how to behave or what to do in certain situations but don't actually reveal Iago's plan since Iago might come after you next. You may want to focus on the themes of love, faithfulness, and jealousy.

2) Identify the major problems between Othello and Desdemona which present themselves from the beginning of the play. If they were a modern-day couple and you were a marriage counselor, what advice would you give them to solve their problems? Identify the problems first and then the advice you would give for each.

Lesson 2

COMPREHENSIVE LESSON PLAN **DATE:** 2 March 06
GRADE LEVEL / SUBJECT/TOPIC: English 12/ Pirate Creeds
DEVELOPED BY: Savannah Oxner
STANDARDS ADDRESSED:
12.4 The student will read and analyze a variety of informational materials, including electronic resources.
d) Evaluate the quality of informational and technical materials.
OVERARCHING CONCEPT: Teamwork
RESOURCES: Primary documents: pirate creeds
LENGTH OF LESSON: 1 day

PLANNING WHAT STUDENTS WILL:

KNOW (STANDARDS/CONTENT): background information on varying pirate creeds, format of a creed

UNDERSTAND (BIG IDEAS, ENDURING UNDERSTANDINGS)

- BIG IDEAS (RELATE TO CONCEPT ABOVE):
  - Even outlaws have integrity and rules.
  - Creeds served the purpose of maintaining order and fairness among thieves.
  - Creeds were a contract for establishing and maintaining teamwork.

- ESSENTIAL QUESTIONS (HOW OR WHY):
  - How do different social classes create their own systems of law and order?
    - Is this order necessary in society?
  - How do contracts (like the pirate's creed) function to preserve order and society? How are they enforced?
  - How do teams function, succeed, and survive?

DO (SKILLS, PERFORMANCE – ACTION VERBS):

- THE STUDENT WILL
  - Analyze pirate creeds for thoroughness and fairness.
  - Generate a Classroom Creed.
  - Explore ways to display the pirate creeds.
  - Investigate classroom strategies and activities they may "plunder" from other classrooms.

PLANNING PRE-ASSESSMENT:

TEACHER DOES:

- WHAT STRATEGY DID YOU USE? Sternberg intelligence surveys

- HOW WERE RESULTS USED TO DESIGN INSTRUCTION? Groups and activities based on Sternberg intelligences

STUDENTS DO: take Sternberg intelligence surveys

PLANNING THE LEARNING EXPERIENCE:

INTRODUCTION (HOOK): Primary documents: Real Pirate Creeds

10 minutes

- TEACHER DOES:
  - Short presentation on Pirate Creeds with notes on purpose and design, and showing original Pirate Creeds as examples.
  - Asks questions about the rules and punishments.

- STUDENTS DO: Discuss several examples from the creeds.

BODY:

- TEACHER DOES:
  - Takes up homework (rules and punishments) to give to Practical group.
  - Directs students to get into pre-organized intelligence groups.
  - Hands out assignments for separate groups, also giving Practical group the collected rules and punishments.

- STUDENTS DO:
  - Get into groups. *25 minutes*
    - *25 minutes:* Practical students: Using collected lists of rules and punishments, creates one universal pirate code for entire class, with 10-15 rules with penalties.
    - *25 minutes:* Creative students: Using MS Publisher, design a layout for our classroom creed that may be printed out for display in classroom and in notebook, making it easy to see and read and also visually pleasing and content appropriate.
    - *25 minutes:* Analytical students: Brainstorm strategies and activities that might be plundered from other classrooms and used in this one. Have them focus on classroom management strategies and learning activities.

- IF DIFFERENTIATED:
  - WHAT(content, process, product)? Product
  - HOW (readiness, interest, learning profile)? Learning profile
  - WHY (What identified need prompted you to differentiate this way)? On a previous assignment, appealing to Sternberg intelligence seemed to greatly improve student participation and success.

CLOSURE: *15 minutes*

- TEACHER DOES:
  - Brings class back together
  - Collects various assignments, saves layout for creed to disk.
  - Reads aloud Classroom Creed.
  - Hands out Learning Contract skeletons. Directs students to sign them, binding them to the Classroom Creed.
  - Assigns exit tickets.

- STUDENTS DO:

- Unite as a class.
- Turn in various assignments.
- Sign and submit individual learning contracts.
- Completes exit tickets.

ASSESSMENT/CULMINATING PERFORMANCE

- DESCRIPTION: Exit tickets
- HOW DID YOU MEASURE:
    - CONTENT (know): Exit tickets
    - UNDERSTANDINGS (related to big ideas): Exit tickets
    - SKILLS (be able to do): Exit tickets

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Lesson 2 Materials

Classroom Activity

Practical

Using the collected lists of rules and punishments, create one universal pirate code for our entire class, with 10-15 rules with penalties. Evaluate the rules and punishments collected by your classmates, sort through them, select the best ones, match the punishments with the most appropriate rules in order to create our universal classroom creed.

Analytical

Brainstorm strategies and activities that might be plundered from other classrooms and used in our classroom. Focus on classroom management strategies and learning activities. Try to think of ways to combine those stolen strategies with our pirate voyage and the research process.

Creative

Use MS Publisher to design a layout for our Classroom Creed. Make certain that our Classroom Creed can be easily displayed in the classroom and kept in your notebooks. Be sure that it is easy to see and read but also visually pleasing and content appropriate.

Exit Tickets

1. Give **2** reasons why Pirate Creeds were important to a crew.
2. What does it tell you about the values of pirates that they had creeds?
3. How are contracts still important today?

Primary Documents

Pirate Creeds

The Articles of John Philips:

1. Every man shall obey civil Command; the Captain shall have one full share and a half in all Prizes; the Master, Carpenter, Boatswain and Gunner shall have one Share and quarter.

2. If any man shall offer to run away, or keep any Secret from the Company, he shall be marooned with one Bottle of Powder, one Bottle of Water, one small Arm and shot.

3. If any Many shall steal any Thing in the Company, or game, to the Value of a Piece of Eight, he shall be marooned or shot.

If at any Time we should meet another Marooner (that is Pirate)and that Man that shall sign his Articles without the Consent of our Company, he shall suffer such Punishment as the Captain and Company shall think fit.

4. That Man that shall strike another whilst these Articles are in force, shall receive Mose's Law (that is 40 stripes lacking one) on the bare Back.

5. That Man that shall snap his Arms, or smoke Tobacco in the Hold, without a cap to his Pipe, or carry a Candle lighted without a Lantern, shall suffer the same Punishment as in the former Article.

6. That Man that shall not keep his Arms clean, fit for an Engagement, or neglect his Business, shall be cut off from his Share, and suffer such other Punishment as the Captain and the Company shall think fit.

7. If any Man shall lose a Joint in time of an Engagement he shall have 400 pieces of Eight; if a limb 800.

8. If at any time you meet with a prudent Woman, that Man who offers to meddle with her without her Consent shall suffer present Death.

Primary Documents
Pirate Creeds

The Articles of Edward Low:

1. The Captain is to have two full Shares; the Master is to have one Share and one Half; The Doctor, Mate, Gunner and Boatswain, one Share and one Quarter.

2. He that shall be found guilty of taking up any Unlawful Weapon on Board the Privateer or any other prize by us taken, so as to Strike or Abuse one another in any regard, shall suffer what Punishment the Captain and the Majority of the Company shall see fit.

3. He that shall be found Guilty of Cowardice in the time of Engagements [battles], shall suffer what Punishment the Captain and the Majority of the Company shall think fit.

4. If any Gold, Jewels, Silver, &c. be found on Board of any Prize or Prizes to the value of a Piece of Eight, & the finder do not deliver it to the Quarter Master in the space of 24 hours he shall suffer what Punishment the Captain and the Majority of the Company shall think fit.

5. He that is found Guilty of Gaming or Defrauding one another shall suffer what Punishment the Captain and the Majority of the Company shall think fit.

6. He that shall have the Misfortune to loose a Limb in time of Engagement, shall have the Sum of Six hundred pieces of Eight, and remain aboard as long as he shall think fit.

7. Good Quarters to be given when Craved [desired].

8. He that sees a Sail first shall have the best Pistol or Small Arm aboard of her.

9. He that shall be guilty of Drunkenness in time of Engagement shall suffer what Punishment the Captain and Majority of the Company shall think fit.

10. No Shooting of Guns in the Hold.

Appendix B – Figures and Graphs

Table 1: Individual Student Scores Before and After Treatment

First SRI	Second SRI
838	1235
1191	1327
1237	1034
1391	1273
1306	1370
1151	958
1414	1341
1142	1212
1096	895
1058	1142
1450	1343
1214	1033
1338	1217
1018	1400
1242	1252
1421	1320
1328	1203
1300	1109
1164	1272
1021	894
1051	1083
889	949
980	907
1106	1079
1092	1214
1189	1138
1322	1335
1064	1173
1229	1229
836	716
1074	1134
1383	1320
1319	1356
1320	1196
875	959
1148	1018
1092	1098

Table 2: Averages of SRI Figures

Avg. of 1st Test	Avg. of 2nd Test	Avg. of Differences
1169.97	1154.97	-15.00

Figure 1: Dependent *t* Test Results

		Paired Differences							
					95% Confidence Interval of the Difference				
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	Sig. (2-tailed)
Pair 1	Before - After	15.00000	141.40584	23.24698	-32.14705	62.14705	.645	36	.523

Paired Samples Test

Figure 2: Students' SRI Scores Before and After Treatment

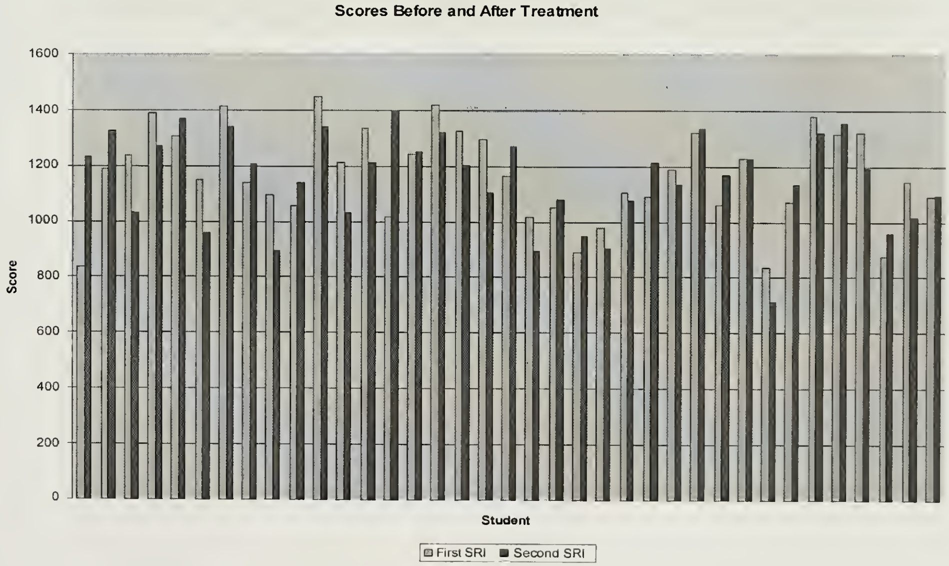
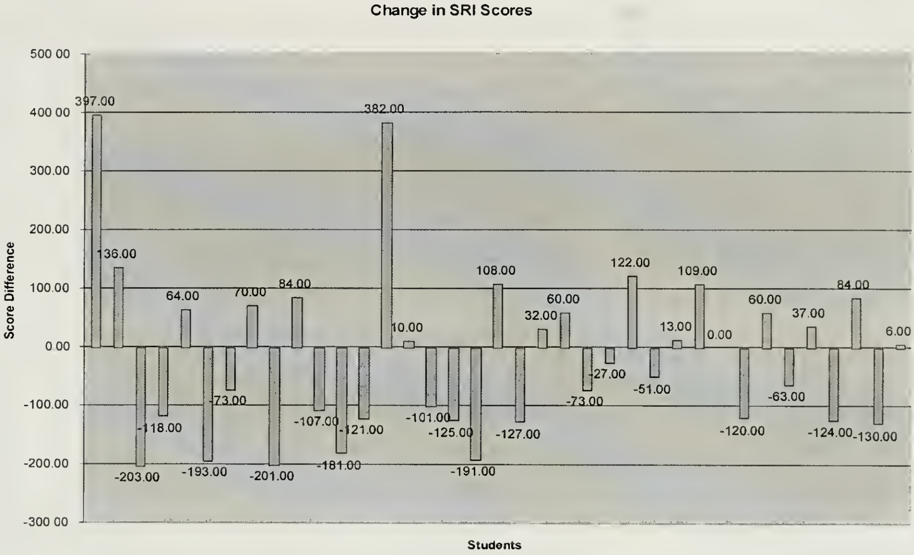


Figure 3: Differences in Individual SRI Scores



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